Gender disparities sited in strategies employed by bee farmers to minimize impacts of climate variability in Kamwenge District.

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Introduction: Climate variability with its implications has in the recent decades occupied fundamental positions in environment debates. Globally, rise in temperatures and high rainfall variability are projected to increase which are likely to result in declining agricultural productivity (Intergovernmental Panel on Climate Change (IPCC), 1997; IPCC, 2007). According to Shankar et al., (2015), water and agriculture will be the most vulnerable sectors affected by rainfall variability. Climate change and rainfall variability specifically with implications such as periods of drought and flood as well as longer-term change, directly or indirectly affect livelihood productivity and access to sufficient nutrients (Ziervogel et al., 2006). In Kamwenge district, bee farming is one of the mushrooming human activity that has seriously been taken up by most farmers as an alternative livelihood (Tumwine et al., 2018). The objective of this paper was establish the impacts of climate variability and establish the coping strategies to rainfall variability adopted by bee farmers in the district.

Located in South Western Uganda (00º11'N, 30º27'E), Kamwenge District is bordered by Kyenjojo district to the North, Kyegegwa and Kiruhura districts to the North East, Ibanda to the East and South East, Rubirizi to the South West, Kasese to the West and Kabarole district to the North West (Tumwine et al., 2018). It is predominantly a rural district with very high poverty levels in the country. Tumwine et al (2018) observe high levels of absolute poverty (26.9) especially among female headed households (21.9) in the district. The district is gifted with tropical high forests dominated by Kibale National Forest Park and Kakasi- Kitomi Forest Reserve (10%), woodland (11%), grassland (22%), papyrus reeds/swamp (3%), open water (3%) with farmland covering 49%. The district receives well distributed bimodal annual rainfall (February to April and September to December) averaging 1200mm throughout the year for most parts. Altitude of the district ranges between 1300 to 3800m above sea level. The district population in 2014, the population of the district was 332,000. According to UBOS, (2017); in 2016, Kamwege district had a population estimates of 442,600 of which 56,938 (13) were refugees. Kamwenge is one of the districts with one of the highest population growth rates in the country (3.91) during the period 2002 to 2014 compared to the national average of 3.03 (UBOS, 2016) (Tumwine et al, 2018).
In regards to data sources and methodology, primary data for this paper was derived from a survey that was conducted in Kamwenge district in 2017. Comprehensive questionnaire was used in data collection from house hold farmers in three sub counties of Kamwenge District. A total of 300 respondents (only bee farmers) were interviewed. Focus Group Discussions (FGDs) and Key Informants provided additional detailed information. Primary data was supplemented with, historical meteorological data that was accessed from Uganda National Meteorological Authority (UNMA) and statistical abstracts from Uganda Bureau of Statistics (UBOS). The data was entered, processed and analyzed using IBM-SPSS 23. Quantitative results like descriptive statistics such as frequencies and percentages were generated using Microsoft Excel spread sheets.

The rainfall data from Kasese district that lies to the west of Kamwenge and is in the same climatic zone was used to show the annual trends of rainfall variability amounts for three decades (1987 to 2016) in

the region. Although annual rainfall amounts range between 753mm and 1288mm per year. These annual rainfall amounts have implications on human activities in Kamwenge District.

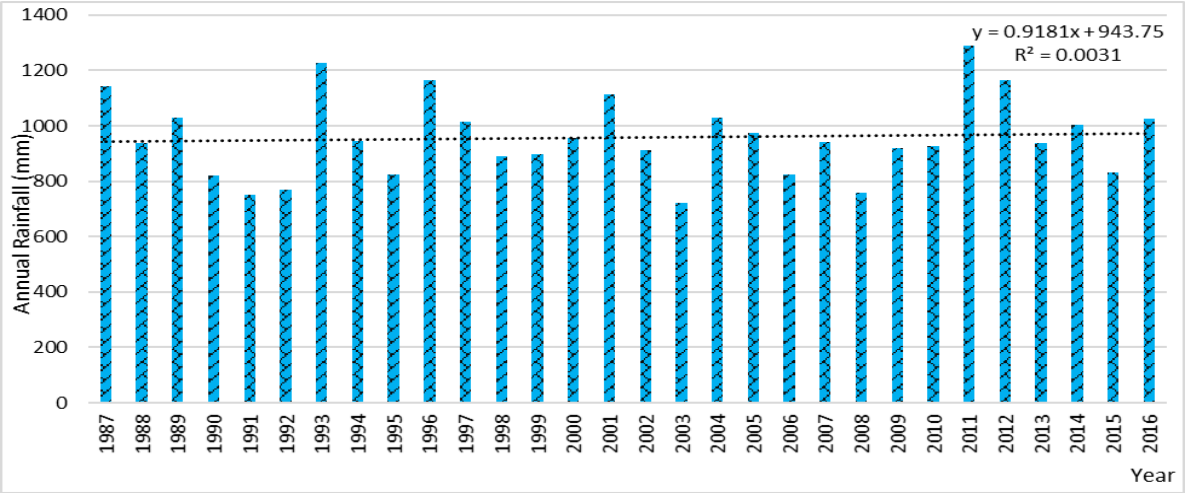

Figure 1: The annual rainfall variability for the three decades in Kasese district

Figure 2 shows the average monthly rainfall variability for the three decades (1987 to 2016) in the region. As depicted in Figure 2, annual average rainfall amount in these three decades was 964mm. The highest average monthly rainfall (above 80mm) were received in the two rainy seasons (MAM and SON rainfall seasons) with the average `peaks in November (127mm) and March (126mm) followed by October (120mm), May (110mm), September (94mm) and march (81mm). It further shows that on average, highest rainfall amounts (341mm) were received in the second (SON) season as compared to 318mm received in the first (MAM) season.

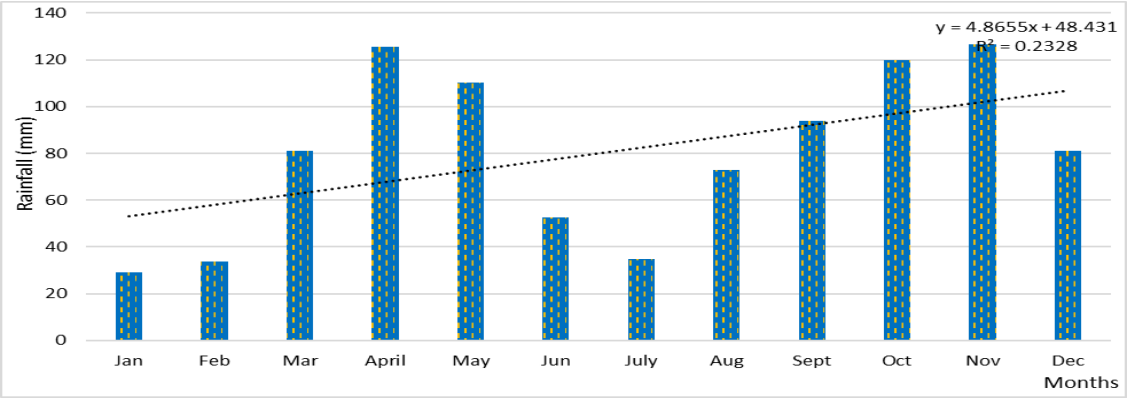

Figure 2: The average monthly rainfall variability for three decades (1986 to 2016) in Kasese district.

As regards to the dry season, the first dry (DJF) season received slightly higher average rainfall amount (144mm) with the peak (81mm) in December with the lowest (29mm) in January closely followed by February with 34mm. Although the average rainfall amount in the second dry (JJA) season (161mm) was more than that in the first dry season, August recorded 72mm average rainfall amount closely followed by June with 53mm and the lowest amount in July with 35mm.

Table 1 illustrates the current climate variability impacts that affect livelihoods of bee farmers in their respective sub counties of Kamwenge District. It should be noted although men are the overall owners of bee hives specifically, women play a key role in conducting and managing the bee farming activities. In their respective sub counties, 23%, 22% and 23% of the male bee farmers in Busiraba Sub County reported that climate variability impacts of loss of crops, decline in farm yields and increased poverty respectively. In Bihanga Sub County, 63%, 20% and 4.2% of the bee farmers disclosed to be affected by loss of crops, decline in farm yields and increased poverty respectively whereas in Ntara Sub County, the highest percentage (41%, 22%, 18%) of the bee farmers reported to be affected by loss of crops, decline in farm yields and increased poverty respectively.

Table 1: Cross tabulation of the gender perspectives of Bee farmers and their perceptions on the current climate variability impacts in Kamwenge District.

Sub County	**Sex**	**Climate variability Impacts**					
		Loss of crops	Increase in Pests / diseases	Decrease in farm yields	Increase in drought	Increase in migration	Increase in poverty
Busiriba	Male	23.1	6.0	22.3	15.7	2.3	22.9
	Female	2.0	0.3	1.7	1.7	0.3	1.7
	Total	25.1	6.3	24.0	17.4	2.6	24.6
Bihanga	Male	63.4	1.4	20.4	4.2	0.7	4.2
	Female	4.9	0.0	0.7	0.0	0.0	0.0
	Total	68.3	1.4	21.1	4.2	0.7	4.2
Ntara	Male	41.2	11.8	21.6	4.4	1.5	18.1
	Female	0.5	0.0	0.5	0.0	0.0	0.5
	Total	41.7	11.8	22.1	4.4	1.5	18.6

Table 2 displays the practices that bee farmers have engaged in the order to cope up with climate variability in their respective sub counties of Kamwenge District. In relation to gender, men dominated in relation to bee farming activities as compared to their female counter parts. In their respective sub counties, bee farmers (39%, 36% and 9%) in Busiraba Sub County reported to be practising afforestation/agroforestry, environmental conservation, and stopped bush burning respectively. In Bihanga Sub County, 47%, 28% and 12% of the bee farmers disclosed to be engaged in small scale irrigation/dam construction, afforestation/agro-forestry and environmental conservation whereas in Ntara Sub County, the highest percentage (49%, 38%, 7.9%) of the bee farmers reported to be engaged in afforestation, environment conservation and small scale irrigation/dam construction.

Table 2: Cross tabulation of the gender perspective of the Bee farmers and their coping strategies towards climate variability adaptation in Kamwenge District.

Sub	**Sex**	**Coping Strategies to Climate Variability**

County		Afforestation / Agroforestry	Environmental Conservation	Avoid bush burning	Avoid Charcoal burning	Irrigation be done / dams constructed	Plant (fast maturing crops) crops early	Increase Bee farming / Pray to God
Busiriba	Male	39.3	36.0	9.3	2.7	2.7	1.3	1.3
	Female	3.3	2.0	0.7	0.0	1.3	0.0	0.0
	Total	42.7	38.0	10.0	2.7	4.0	1.3	1.3
Bihanga	Male	28.4	12.8	0.0	0.0	43.1	8.3	0.9
	Female	2.8	0.9	0.0	0.0	1.8	0.9	0.0
	Total	31.2	13.8	0.0	0.0	45.0	9.2	0.0
Ntara	Male	49.4	38.2	1.1	0.0	7.9	2.2	0.0
	Female	1.1	0.0	0.0	0.0	0.0	0.0	0.0
	Total	50.6	38.2	1.1	0.0	7.9	2.2	0.0

In conclusion, loss of crops, decrease in farm yields and increase in poverty were the major impacts of climate variability. And this has been well illustrated by the rainfall data. Bee farmers have so far used afforestation / agroforestry, environmental conservation and small scale irrigation as coping strategies. More needs to be done by all responsible stake holders to enable rural communities become resilient.

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